Do new business graduates have the computing skills expected by employers?

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Abstract

Computers have become ubiquitous. Most households have access to a computer and certainly schools from kindergarten to university give their students the use of computers and other technology on a daily basis. The high prevalence of computer use may lead employers to assume university graduates will have good computing skills. Such assumptions may be the reason that employers use broad terms to advertise the computing tasks required for graduate-level positions. This paper investigates how well the expectations of employers match the perceptions of senior students about their computer skills. Four graduate-level positions seeking to attract recent graduates with business degrees were identified from advertisements. The employers who were responsible for the writing of these advertisements were surveyed by interview and questionnaire. Twenty-one senior students about to graduate from a university business studies programme were also interviewed and surveyed. Results showed that the wording used in the advertisements did not clearly articulate the requirements and intentions of the employers. Results also show that the senior students, while about to enter the workforce, had little idea of the end-user computing that would be required of them and that the perceptions they had of their own computing skill frequently did not meet the expectations held by employers. This study highlights implications for three groups: employers, graduates and educators.

Keywords: End-user computing, graduate computing skill, workplace computer skills, computer self-efficacy, self assessment

1. Introduction

This paper is about the perceptions that senior university students close to graduating have of their computing ability and the expectations that employers have about the computing ability new graduates will bring to the workforce.

Four graduate-level positions, representative of business domains, were identified from advertisements placed in order to recruit graduates. The four employers who placed these advertisements were surveyed by interview and questionnaire. Twenty-one senior students about to graduate from a university business studies programme were surveyed by interview and questionnaire.

Computers are a part of everyday life. They are present in most classrooms and certainly at universities. The generation who are about to graduate have grown up surrounded by and using computer technology. These new graduates will be employed by people who come from previous generations who did not grow up with computers, but learnt specific skills as the need arose. The older generation tend to expect that the younger generation will have developed strong computing skills by the time they have graduated from university.

Most employers hiring business graduates require them to have some level of end-user computing skill. Sometimes this need is not advertised but is still expected. At other times this requirement is expressed in job advertisements or position descriptions. While it is expected that new business graduates will have computing skills, the way they are described can be confusing. Just glancing at positions on employment web sites, is enough to reveal that there are many different ways of expressing the computing requirement for a job. Advertisements for what appear to be similar roles may use completely different terminology to describe the end-user computing skills required. Most use broad terms and statements such as:

- "Must be computer literate"
- "Advanced computing skills"
- "Expert in Word and Excel"
- "Strong MS Office skills"

The key aim of this study is to identify whether there is a disparity between employers' expectations of the end-user computing skills new graduates possess and the skills that the graduates claim to have. To do this it is necessary to know the kinds of tasks required in an end-user computing sense in a workplace and the terms used to express these tasks.

2. Literature Review

There is literature available regarding the skills necessary to succeed in the Information Technology (IT) field, but not a great deal regarding the end-user IT skills needed to succeed in a general business area. However, there is evidence of a shortage of people with genuine end-user computing skills in all business positions [1]. A 2001 study undertaken by Rainsbury [2] asked students and graduates from a university business studies department to rank the skills they saw are being the most important for entering the workforce. Participants ranked

computer literacy, customer service orientation, teamwork and co-operation, self-confidence, and willingness to learn as being the most important. The study found the graduates, those already in the workforce, were more likely to rank "hard" [1] skills as more important than "soft"[2]skills, which differed from the opinions of most of the current student participants who considered interpersonal skills to be more important. The results of their survey ranked computer literacy as being the highest ranked overall (hard and soft) skill necessary to enter the workforce [2]. McLester and McIntyre [3] found it "less than surprising" that employers appear to place more value on "applied skills" such as leadership, teamwork and problem solving, than they did on the more traditional literacy and numeracy skills.

According to McLester and McIntire [3] employers in their study reported that while new employees seemed to be reasonably skilled in the "applied areas" they were often disappointed with the level of traditional skills, including the IT skills candidates had.

Although there is agreement that a base level of computing skill is expected both in education and in employment, confusion arises as to how this level should be identified and articulated. Often any assessment is by way of self review. Information Technology is a very broad area comprising many facets; consequently the context in which an assessment of ability is required must be taken into consideration. Depending on the situation, assessment of our own computing knowledge can change. Compared with someone who has never used a computer you may be an expert but conversely, compared with a software developer you may see yourself as having intermediate end-user skills. An individual's interpretation of their own computing ability very much depends on what it is they know or their field of reference [6]. When a person is applying for a job in a specific IT area they are likely to be given some kind of test. However, when a business graduate is applying for a position within their business domain it is unlikely that their end-user computing will be tested. The businesses concerned are understandably interested in an applicant's knowledge in the key domain (marketing, finance, etc), and may assume that the appropriate level of computing skill has been met.

Self-assessment of computing skills can take different forms. These range from the informal "ask and rate" where a person is asked to rate themselves, to a more formal survey where a person is asked to pick the level at which they assess their ability to be.

The use of self-assessment as a way of rating the computing skills of students entering university was likely to confirm a leniency bias. Students are more likely to rate themselves at a higher level than their actual level. Often both less experienced, as well as the more experienced students, were liable to over-rate their computer competence [7].

While self-assessment should not be used alone as an accurate measure it can be useful as a method of motivating people to take responsibility for their own learning [8]. In an attempt to overcome the flaws using self-assessment on its own Grant, Malloy and Murphy [9] undertook a survey which combined a self-assessment survey with a skills test. This study compared the skill-assessment of incoming university students with the score they received in an online computing test. Students were tested using the commercially available SAMS 2003 Challenge test[3], with the 35 test questions being selected by the IT faculty at the college the students were enrolled in. The results showed that the students were likely to rate themselves more highly than the actual tests results showed. Of the three common software tools used in the tests, word processing, presentation software and spreadsheets, the most significant difference were with the spreadsheet software. In this area the students' perceptions of their ability was in excess of their actual ability as demonstrated by the results of the online tests. For the word processing software and the presentation software the results showed that the difference between perception and actual ability were not significant. While it is interesting to see a study where self-assessment is being used in conjunction with actual testing, the results suggest that some caution should be taken as the level of tasks tested is difficult to verify [9].

The use and availability of computing technology may give a false impression of the competency of computer users, however not all people who have easy access to computers find using them to be easy or something they feel comfortable with [10]. People's perception of their ability is affected by their self-efficacy toward a particular task.

Computer self-efficacy (CSE) is derived from the theory of self-efficacy (SET) where self-efficacy is defined as a person's belief in their ability in specific situations. [11] Computer Self-efficacy (CSE) can be described as a person's perception of their computing ability. Fundamentally CSE suggests that a person's perception of their ability in certain tasks can very much depend on whom they are comparing themselves with and the past experiences they have had ([12][13][14]). CSE has been identified by some researchers as a better predictor of performance than actual capability because a person's judgments, based on prior experience, may determine how a person will use the skills and knowledge they have in specific domains [15]. However, inconsistencies in a person's CSE may occur because of misjudgements of knowledge or task requirements [11]. Many students begin university with immense confidence in their ability to use computers, but are often not capable of completing tasks without extensive instructions [15].

3. Method

A multiple case study approach was employed using a selection of four job advertisements (table 1) which were considered to be representative of positions business graduates would apply for.

To meet the objectives of this study a mixed method approach was used for data analysis. Mixed methods were employed to expand the scope and improve the analysis by combining the power of both qualitative and quantitative techniques ([17] [18]).

For this study two groups of participants were used: senior students and employers.

Student participants were all current students nearing completion of business degrees, and who were actively seeking employment. To recruit senior student participants, initial contact was made with lecturers teaching final-year commerce courses. The lecturers were given an explanation of the study and a request was made for the researcher to attend classes in order to recruit. The courses involved were two business management courses, one marketing course and one accounting course. At each of these lectures the study was explained to the class and their help requested. A list was compiled of the names

[1] Hard skill: skills associated with technical aspects of a job [4].
[2] Soft skills are the skills that place importance on personal behaviour and managing relationships [5].

[3] SAM Challenge 2003 is a skills assessment from Course Technology. SAM offers skills assessment of the Microsoft Office Suite in a simulated environment. [9]

and email addresses of those students willing to help. Emails were sent to students randomly selected from this list of names. These emails resulted in a total of twenty-one senior student participants.

The four employer participants were the employers responsible for the job advertisements used and who were intending to employ business graduates.

Qualitative data was collected using semi-structured interviews. The interviews were based on a series of open-ended questions relating to the job advertisements. Employers were asked to detail the type of computing that would be required in the position for which they were hiring. Students were asked to give their interpretations of the skills required based on the advertisement they were shown.

Quantitative data were collected from questionnaires given to participants. The questionnaires asked task related questions for each of the MSOffice suite of application (table 2) and were based on questions from ICDL (International Computer Drivers Licence) and MOUS (Microsoft Office User Specialist) as these standards are readily available worldwide and are considered reliable when assessing information technology skills ([7] [20]). Students were asked to rate their own skill level for each task. The employers were asked to rate the required level of skill for each tasks for the advertised position.

	Position	Degree	Organisation	Term used
Case1	Marketing Assistant	Marketing	Manufacturing	*Can handle most Office applications*
Case2	Customer Services	Any business degree	Online sporting goods	*Strong computer skills*
Case3	Assistant Accountant	Accounting	Government consultancy	*Good on computers – especially spreadsheet and databases.*
Case4	Graduate Accountant	Accounting	Chartered Accountant	*No computing mentioned*

Table 1- Summary of advertisements

MSOutlook	13 questions
MSWord	35 questions
MSExcel	30 questions
MSAccess	27 questions
MSPowerPoint	23 questions

Table 2 - Number of questions for each MS application

4. Results

Interviews

All interviews were analysed using thematic analysis. Thematic analysis is a means of recognising, analysing and reporting identifiable and repeated patterns often found in interview data [19]. As a result of this analysis, strong themes arising from the interviews with the senior students were identified. These themes will be discussed in line with employers' comments.

In the interviews with employers, each was asked to explain what they meant by the terms they used regarding the computing requirements of the position. They were also asked to describe some of the computer-based tasks associated with the position.

Student participants, in their interviews, were each shown one of the advertisements. The advertisement shown depended on the type of career the participant was pursuing. Accounting students, for example, were shown the advertisements for accounting jobs, and marketing students were shown the marketing job advertisements. The students were asked to give their interpretation of the description of the computing skills mentioned in the job advertisements they were shown. In each of the cases, the range of interpretations was wide. Often these interpretations were quite different from those given by the employer.

Differing interpretations

Can handle most Office applications: The Marketing Assistant position required applicants to be able to *handle most Office applications*.

Students thought they knew what was required in this role. Typical responses included:

> *Need to be able to use Office. That shouldn't be an issue because anyone who can use a computer can use Office [S 19].*

> *MSOffice or something like that. Word or Excel and as a Marketing Assistant you would need Power Point because Marketers do lots of presentations [S 10].*

When asked to define what he meant by this term, Employer 1 said:

> *In this position we wanted a bit more with Photoshop work and we have an internal system which is an accounting system which we would expect the assistant to be able to manipulate to get data and forms into Excel worksheets from information they can get out of that into the system...*

Here we see a clear difference between the students' interpretation of the requirements and those that were in Employer 1's mind.

Strong computing and keyboard skills: Similarly, in Case 2 (the customer services role), the employer requirement differed from the student interpretations. Students appeared confident they knew, from the advertisement, what the computing tasks and skill level would be in the job. Responses included:

> *Sounds like general Word processing. They probably want high words per minute rate [S4].*

> *Strong computing would mean knowing how to turn a computer on and off and knowing how to fix it if there was a problem [S 2].*

Employer 2 defined the company's computing requirement by saying:

> *We are looking for someone who can do everything [computer wise] in the office: email, data entry – usually into a database also there is a trouble shooting aspect –we are always looking for process improvement. We expect that the person will be competent using a mouse—thinking before you enter information and will have a sense of where they are in terms of making errors.*

Good on computers especially spreadsheet and databases: The third case in this study was an Assistant Accountant position. Here the advertisement included the phrase "Good on computers especially spreadsheets and

databases". Student interpretations for this role again suggest participants were confident in their understanding of what computing skills would be required. Responses included:

> *You would need to know how to do calculations in Excel and maybe something about building models. But databases are not really important for accountants [S 4].*

> *Spreadsheets are important but databases are not really important [S 9].*

Employer 3 defined the required computing for this position as**:**

> *We need someone who feels comfortable enough on Word and Excel, probably especially Excel. Why they need that is that there is a lot of processing involved. This may be accruals. So being at a very basic level or someone who is not very proficient or feels very confident using spreadsheets probably would not prosper in this role. So they need to feel comfortable setting up a spreadsheet or altering a spreadsheet.*

Interestingly, we see here a closer match between employer's requirements and the students' interpretations, although it is interesting to note that the employer's explanation did not include mention of database skill even though databases were specifically noted in the advertisement.

No computing skills mentioned: In Case 4 (the graduate accountant position), there was no mention, in the advertisement, of any computing requirement. Students were asked for their interpretations as to why computing skills may not have been included in the advertisement for the Graduate Accountant position. Typical responses included:

> *For a graduate level accounting job they should not have any expectations of any experience because they bring in a graduate and train them [S 1].*

> *They assume that anyone leaving university will have computing skills [S 7].*

Employer 4 gave the following explanation as to why computer skills are not specifically requested in graduate employment notices.

> *We figure that they have gone through university so they are not completely stupid. If you have got through Varsity you know how to use Word to a certain extent and Excel and Outlook…not like my Mum she would need to be trained on how to open files [E 4].*

The expectation that university graduates would have strong computing was also expressed by another employer (Employer 1) in this study.

> *I take for granted that they will pretty much know a lot more than I did when I graduated from University [E 1].*

"I know what computing skills are required": In all the cases, the interpretations that students made were quite varied. Likewise, each student was confident that the interpretation that they made was an accurate assessment of the computing skills that would be required.

> *As a Marketing Assistant you would need Power Point because Marketers do lots of presentations [S 10].*

> *I would expect that this Customer Services person would need to know about Web sites etc and probably they would want an IT graduate [S 5].*

> *For an assistant accountant position of course you would need to know Excel because you need to use a spreadsheet to prepare financial statements [S 3].*

"We don't need to know because they will train us": This next theme suggests that many of the students were not concerned about any deficiencies in their existing skill set as they expected training would always be available.

> *No I don't expect that they will already think I can use this type of software – there will be some training involved [S 9].*

> *Actually I would probably ask in the interview about training [S 4].*

In contrast, there was an expectation from employers that new students would already have the skills necessary for the required workplace computing.

> *If you are teaching Business at university I would be really surprised if you didn't teach computer skills [E 1].*

Importantly, in the four cases explored in this study, training was only mentioned by one employer. Employer 4 stated that he did arrange training sessions for his staff when and where a need was evident, and in the past had arranged specific computer application training.

Questionnaire results

The students were asked to address the questionnaire from the point of view of their own skill. The employers were asked to answer from the point of view of the expectations they had of future employee's computing skills. The student participants were also asked to complete a section of demographic questions.

Demographic results

In total, 21 students (male = 10, female = 11) took part in this study. The ages of participants ranged from 19 to 28 years and the mean age was 21.75 years (sd = 3.1). One person had taken no formal computing at university. Seventeen had studied first-year computing only, three students had studied a second-year, end-user computing course, and just one participant had gone on to study a third-year, end-user computing course.

The students indicated that they had, in general, used computers for a relatively long time ($\bar{x}$ = 11 years, sd = 3). One person reported having used a computer for less than 5 years, and 17 had more than ten years usage. Four in this latter, high-usage group had more than 15 years experience with computers.

Students were asked to rank their perception of their own computing abilities for each task on a 5-point, Likert-type scale (1 = "having no skills to 5 = "very advanced"). No student chose to rate themselves as "very advanced", and no student admitted to having no skills. Only one rated his skill level as "basic". In general, they indicated that they considered their skill level to be moderately advanced ($\bar{x}$ = 2.6, sd = 0.6). The results from the student skill perceptions and the length of time they had were plotted on a scatter plot (Figure 1). While not statistically significant, these data suggest that the confidence that the younger generation have in their ability to use computers may be as a result of the time over which they have been exposed to the technology.

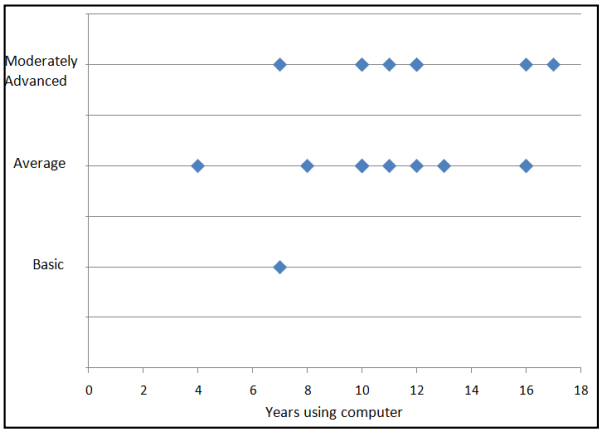

Figure 1 - Graduate skill-level and years using computers

Overall task comparisons

Sign tests were used to test for reliable differences between graduates' self-perceived skill level and the employers' required level of skill for the job. Briefly stated, a sign test is a non-parametric technique used to test the null hypothesis that two distributions do not differ significantly from one another. These tests were performed using the means of the student skill perceptions and employer expectations for each task in each of the software applications.

If we examine all tasks across all applications, the results showed that students' self-perceived skill level exceeded the employers' required level of skill (64 to 36, $p < 01$). Table 3 outlines the mean scores for each individual application. Looking at the applications individually, students' scores were higher than employers' scores significantly more often in Word, Access and PowerPoint ($p < .05$, in all tests). There were no significant patterns of differences across the Outlook and Excel tasks, although notable differences were evident in specific aspects of Outlook.

	Employer	Student
Outlook	3.2 (sd 0.8)	2.9 (sd 1.1)
Word	3.2 (sd 0.8)	3.0 (sd 1.1)
Excel	2.8 (sd 0.9)	2.8 (sd 1.1)
Access	1.3 (sd 0.4)	2.3 (sd 1.1)
PowerPoint	2.2 (sd 1.1)	2.8 (sd 1.0)

Table 3- Mean scores for task related questions

Summary of results

The results identified factors, relating to the required level of workplace computing skills that may affect the transition from university to the workplace for both graduates and those employing them.

The interviews with employers and students, along with the questionnaire results from both groups, revealed some interesting results. While some of the themes exposed in the interview data were specific to the employers or the students, there were also elements common to both groups.

The study has shown that several, very different interpretations can be derived from one advertisement. In all of the cases, there was a range of understanding of the computing terms used to describe the computing requirements for the role. It has also shown that those writing the advertisements may, at times, be too economical in describing the computing needs of a role. This economy may arise because they have certain expectations of a graduate's abilities on the computer, or that they have little experience in writing advertisements. Employers generally expressed the opinion that any graduate would have the necessary computing skills once they had completed a degree. In fact, there was a widespread, if somewhat vague, opinion amongst both groups that anyone, especially the younger generation, can simply "use computers".

It was also clear that some of the students had inaccurate estimations of the level of computing that they would need for the workplace. The interview data suggested at least one reason for this inaccuracy: some of the student participants focussed on parts of the advertisement rather than the advertisements as a whole, which may have led them to emphasise certain, perhaps more familiar, skills over others. The different interpretations of the advertisements among the students appear often to be due to the words in the copy on which they subconsciously focussed. Some of the students read the whole advertisement and made their interpretations based on all the information given. Others appeared to focus on just the terms used to describe the computing required. Still other students limited their focus even further by appearing to ignore some of the words in the phrases used. By limiting their focus when reading the advertisements, the students were, conceivably, seeking out a skill or task with which they felt comfortable. This occurrence is shown in Case 2 (the customer services role). Here some participants focussed on the words *Strong and Keyboard* (from the phrase *"Strong computing and keyboarding*), combined these words, and then went on to interpret this as meaning "being able to touch-type". This may be a case of the student's perception of self-efficacy toward those tasks, influencing the level of comfort they have with them. A person's self-efficacy toward a task, as discussed in the literature review, can affect how they feel about that task and may explain the range of foci the students took when reading the advertisements and making their interpretations ([6] [16]).

The students who participated in this study had a distinct a lack of awareness regarding the types of computing skills they may need in the workplace and how they might be asked to use them. Most of the students considered that their computing skills would be of a high enough level for them to use in any workplace. Often, those who have little or no formal computing training regard their level of skill as being the same as those who have received formal training at a higher level. This appeared to be the case with the near-graduates who took part in this study.

A specific theme to emerge from the interviews was the students' assumption that training would be available when they began a new job. The students were of the opinion that any employer would have training available in any of the skills which they may be lacking, and expressed confidence in their ability to learn these new skills. This perception was quite clearly not shared by the employers. Instead, employers were of the opinion that any university graduate would have a good level of computing skill. They believed that, even if training in the skills was not given as a formal part of coursework, these skills would, nevertheless, be acquired as the students used them to complete the coursework. Word-processing skills, for example, would be learned and improved as students completed course work.

5. Conclusion and recommendations

A major implication of this study is that if the lack of communication between employers and prospective employees continues, employers may not be employing graduates with the level of computing skill they are seeking. This may be due to the differences in understanding between the interpretations made by graduates reading advertisements for jobs and the actual meaning the employers writing those advertisements were trying to convey.

A further implication for employers is the difference between the level of computing skills the students have compared with the level they believe they possess. Students in this study only gave their perceptions of their skill level. As stated, self-assessments are flawed inasmuch as participants will give an overly optimistic view of their level of skill. This may mean that the students may present themselves to employers as having a higher level of computing skill than they actually have.

These implications highlight the requirement to make the following recommendations to employers, senior students and educators.

The main issue that should concern employers is the lack of clear communication used to communicate job requirements to new graduates. This study has shown that the students have been unable to correctly determine the requirements of a job from reading the descriptions provided in job advertisements. It is recommended that employers amend their assumptions about the computing abilities of graduates and to provide detailed information about the computing skills required for a position.

Employers are also encouraged to communicate with those educating graduates about the types of skills that graduates are expected to have when beginning work in order to mitigate the mismatch match between skills and expectations.

One of the main outcomes of this study was the lack of information students have about the workplaces they are likely to enter. The students based their perceptions of the skills they would require in the workplace on the level of computing skill they possess when graduating. Often, these perceptions were at a level lower than the expectations employers had of the computing skill level graduates would have on entering employment. Students are encouraged to seek advice regarding the skills they are likely to need in the workplace. In the first instance, they are encouraged to seek this advice from those educating them so they can be better prepared when beginning their careers. Students are also encouraged to be more circumspect regarding the assessments they make of their computing ability. Although it is common for an individual to base any self-assessment on what he knows, in the case of computing skills graduates should be encouraged to rate their ability according to the level of formal computing they have studied.

Educators are reminded not to expect that all those arriving at university will have, by virtue of belonging to a particular generation, the computing skills necessary to be ready for the workplace without any formal tuition. Those designing programmes of study are urged to communicate with employers regarding both the domain and non-domain skill set required of graduates so these skills can be accommodated within programmes of study and reflected in graduate profiles.

The results of this study clearly demonstrate that there are differences between the requirements that employers are trying to express in job advertisements and the interpretations that graduates make when reading job advertisements. Employers have an expectation that all graduates would have good computing skills and the students, after little formal training, had high perceptions of their computing ability but little understanding of workplace computing requirements. This study has confirmed to the authors that this is an issue that requires consideration by all those involved in both sides of the employment process.

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